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THE RELATIONSHIP OF SCIENTIFIC MANAGEMENT TO LABOR

The problems identified with the development of our industries will undoubtedly be viewed and analyzed from as many conflicting angles as there are classes in the community. The manufacturer, the business man, the professional man, and the working-man, each will have a different viewpoint; each will reach a decision influenced, to a greater or lesser degree, by his own self-interest. The final solution will be found, not in the dictum of any one of these classes, but in the equitable and harmonious combination of every one of them. I admit, beforehand, the difficulty of securing such harmony, but I am strongly of the opinion that an exchange of views and their unbiased consideration and discussion by an assemblage of this kind will go far to promote it.

It is as a member of a trade union composed of skilled mechanics that I am endeavoring to examine and analyze "scientific management" in its relation to labor.

This system for the increasing of production, popularly called scientific management, is a subject of sufficient importance to the wage-earner and the industries of our country to warrant the careful examination of all thoughtful men, for, in addition to the problem of production, it involves the workman's standard of mechanical efficiency, his physical welfare, and his social status. If scientific management in its final analysis fails to increase the workman's earnings, develop his mechanical ability, lengthen his period of usefulness, elevate his standard of living, and distribute equitably between capital and labor the gains from increased productiveness, it has failed to deserve the title conferred upon it.

With the object of avoiding any confusion of terminology in the discussion of the subject, the following definition is submitted:

Under the name scientific management, we have in mind those methods for increasing production which have been advocated within very recent years by several gentlemen who are recognized as among the most prominent advocates and exponents of systems for the standardization, systemization, planning, and routing of

work in manufacturing establishments and in offices, the grouping and operating of machines to their greatest efficiency, coupled with time studies of manual movements, the elimination of unnecessary motions by employees while at work, and their stimulation to greater effort by piece-work, bonus, task, differential, premium, or other systems, rather than by a daily wage rate.

Any system which will lower the cost of production by eliminating inefficient management or unnecessary labor through the adoption of more practical methods of operation should be welcomed and encouraged; for inefficiency in any form can result only in placing a needless burden on the cost of production and, to whatever extent it exists, must correspondingly retard the progress of industry and the production of wealth. Whether in the machine or in the workman himself, all motions which do not accomplish definite and practical results, all unnecessary movements, result only in wasted energy, and wasted energy is a dead loss. With any system which will eliminate useless labor the American trade-union movement will be found in full accord.

From an examination of scientific management as presented in the books prepared upon the subject by some of its best-known advocates and exponents, it would appear that it aims to secure greater production from machinery and workmen, (a) by systematizing, standardizing, and overseeing all work, by speed, repair, inspector, and gang bosses or functional foremen and over-foremen; (b) by having time studies made by experts with split-second watches in hand, with which to note the time consumed in performing each motion made in connection with the work; (c) by having studies made with the object of eliminating all useless motions so that production can be increased; (d) by having the time to perform a given piece of work determined by an expert from the records secured; (e) by the minute subdivision and specialization of the work, and the employment to the largest degree possible of laborers trained to work under the system of subdivision and specialization, rather than the employment of skilled mechanics; (f) by the payment of a bonus or premium to workmen for measuring up their day's work to the task set, and the payment of similar inducements to the foremen and over-foremen for maintaining the

quantity of production of the gangs of workmen, or the departments under their charge.

As presented in the works upon the subject, scientific management as applied to workmen moves with the smoothness of a well-oiled and perfected machine: each one performs his part with the accuracy of a mechanically and mathematically perfect tooth on a gear wheel, when it meshes with the teeth of another wheel in transmitting power. But whether this system accomplishes with workmen in everyday practice what it seems to accomplish with them in books is a question which we desire to investigate.

Before entering into an examination of the relationship of scientific management to labor, there is one fact which is deserving of consideration in connection with the discussion. The American workman, as verified by the great mass of statistics upon the subject, produces more within a given time than the workman of any other country. He has no equal as a producer; this being due partly to his mental and physical alertness and ambition, and partly to the various systems of specializing and speeding up which were well developed before scientific management was brought forward as an industrial stimulant. That he has worked under such high pressure as prematurely to age him has been well demonstrated by the policy of many corporations to hire no workman over forty years of age or one whose hair is tinged with gray.

High tension and intensity of application have become marked features of our industries. Machinery is operated to its physical limit, and when worn out is thrown on the scrap heap; workmen, likewise, are expected to work to their physical limit, and, like the worn-out machines, they, too, are liable to find themselves in the industrial scrap heap when there should still be years of effective labor in their minds and bodies. As illustrating this tendency in our American methods of production there is the illuminating testimony given by Mr. Harrah, of the Midvale Steel Company, before the Congressional Committee on Labor, March 1, 1900. A portion of the committee's record for that date reads thus:

MR. GRAHAM: "I was going to ask whether you thought that you could put your machines so as to accomplish getting out more work in eight hours than you can now in ten?"

MR. HARRAH: "No. The machines are worked to their fullest capacity now."

MR. GRAHAM: "You would have to get some kind of improved machinery?"

MR. HARRAH: "We have the most improved kind of machinery now; but we make it a rule to run a machine to break. For instance, the life of a hammer bar may be two years. If that hammer bar does not break within two years, I go for the forge master, because I know he is not getting the work he ought to out of the forge. It is the same way in the machine shop. If a lathe, the natural life of which might be two years, does not break down before that, I would go to the engineer in charge."

MR. GRAHAM: "Everything is run to its full capacity now?"

MR. HARRAH: "Absolutely. Yes, sir; we have absolutely no regard for machinery or men."

The Midvale Steel Company is one of the plants where scientific management was first applied by one of its leading exponents.

Instead of burdening this paper with additional evidences of the intensity of labor in this country, the impressions of two of the world's greatest thinkers as to its effects will be submitted.

On the occasion of his last visit to the United States, that eminent philosopher, Herbert Spencer, after noting the intensity with which our toilers were working, declared that the time had arrived to preach and practice "The Gospel of Relaxation." Last year another famous British scientist, Sir Thomas Oliver, visited our shores. After attending the Congress of Hygiene at Washington, he visited a number of our industrial centers, expressing some of his impressions later on, in part as follows:

Generally speaking, work is rushed too much and life is lived at too high pressure in the United States. There is no reason for either. Work and the love of work for the monetary gain it brings are more characteristic of Americans than of most other people, and yet what is the gain if life is shortened by the strain imposed upon it in trying to obtain these? A nation whose workmen are old at forty is certainly not only not rich in men, but it is not doing its best for them.

That the American workmen are now working at higher speed and producing more within a given time than the workmen of any other country, we are confident cannot be successfully questioned.

With these brief preliminary thoughts, we may proceed to examine more carefully scientific management in its relation to

labor, as its influence and effect upon labor are of more importance than any other feature it may possess.

While scientific management in some of its phases has entered into the most minute details, on some important factors connected with production it touches but lightly and indefinitely, while other equally important ones are practically ignored. This last is particularly true of its attitude toward workmen, the flesh-and-blood human beings who are to be developed into semi-automatic attachments to machines or rigid and inflexible forms of directing production, if one feature of this system is to be applied.

The efficiency of a workman is not to be determined solely by his ability continuously to feed and operate a machine or perform some other task with a never-changing motion at high speed, acquired as the result of time and motion studies by those who may be employed as experts in this work. To a very large extent his efficiency will depend upon his alertness of mind and physical responsiveness, and his ability to maintain both under the numbing influence of his monotonous task.

During recent years there has scarcely been a convention of employers at which papers have not been read bemoaning the difficulty of securing competent mechanics, and proposing plans by which mechanical knowledge among workmen may be increased. Trade unions have been unjustly accused on the one hand of preventing apprenticeship, while on the other, and in contradiction of that charge, an effort is made to discover the reasons why the boys of the rising generation seem unwilling to apprentice themselves in the trades. So strong is this disinclination on their part that during the past decade the wages paid to apprentices have been practically doubled, and yet in many industries it is most difficult to secure or retain apprentices. It is our opinion that the intense specialization and subdivision of work as developed in our American systems of production is the most prominent cause; for the boys and their parents have come to believe that apprenticeship in most cases does not mean the development of mechanics, but rather the production of specialists who are skilled only in some simple process into which the method of production has been subdivided, and who are unable because of their lack of mechanical and manual

skill to hold their own as journeymen mechanics on the termination of apprenticeship.

In Germany, that country which today stands out so prominently as a land where all-embracing scientific methods are applied, the workmen have reached a degree of efficiency which makes them the peers in mechanical ability of those of any other nation; and this efficiency on their part is the result of the broad and thorough-going mechanical and theoretical education which they are given as apprentices, and the opportunities which are afforded to them afterward as mechanics to become familiar with the theory as well as the practice required in the industry in which they are engaged.

Through their co-operative courses, in which the coming generation of engineers are being educated, our leading universities are recognizing the principle that theoretical knowledge must be supplemented by practical experience in the industries during the course of study, if the highest efficiency is to be attained. And likewise the manufacturing establishments are learning that well-equipped superintendents and foremen cannot secure satisfactory results from workmen deficient in mechanical skill and knowledge.

Advocates of scientific management will contend that it is not their intention to speed the workman to his extreme physical limit, and it is quite possible, by quoting detached expressions from their works on the subject, to give a color of truth to this contention. But no practical man acquainted with the methods of production and the influences which emanate from the management of a corporation through the superintendent, foremen, and sub-foremen to the workmen, to stimulate their productivity, will fail to realize that, even though the system of scientific management with its time studies, its precise form of organization, and its premiums and bonuses to workmen and foremen for quantity in production, was established in any plant by the best trained and most just experts and with a proper care that no workman should be driven to speedy physical exhaustion, it must soon degenerate into a system under which each workman would be forced to labor to the physical breaking-point or drop out to make room for others whose vitality had not yet been exhausted.

In fact, in the well-known reference to the laborers in the

Bethlehem Steel Works, Mr. Taylor, in his book on *Shop Management*, says: "The tasks were all purposely made so severe that not more than one out of five (perhaps even a smaller percentage than this) could keep up."

Perhaps no one has had a greater opportunity of studying the effects of various systems of shop management on the workmen employed than Judge Higgins, president of the Court of Conciliation and Arbitration for the Commonwealth of Australia, and as his views on this question are most valuable in connection with the subject now being considered, a few excerpts from a recent decision which he prepared are submitted. The case was one arising in the shoe industry and those portions of the decision having a direct bearing on the present subject read:

The claim of the employees in these proceedings as to apprentices is, in effect, that there should be no boys employed unless apprenticed to learn some substantial portion of the work of a factory; that there should be no "improvers," that the number even of apprentices should be limited to one apprentice to every four journeymen; that the wages should be settled for each year of apprenticeship, and that the apprentice should be properly taught.

I am glad to see that the claim makes, in the main, in the direction of industrial efficiency. At present all the conditions of boy labor in this great Australian industry tend in the direction of inefficiency, and as the men trained to make boots by handwork, from start to finish, pass from the trade, there is every prospect that in place of intelligent, skilled artisans the commonwealth will have thousands of anemic, ill developed, undertrained factory slaves, youths unfitted for any work but the feeding of some one insatiate machine, youths prematurely put under the strain of bread-winning, and soon to be replaced by other youths, ad infinitum.

The employees want, as far as it is possible, to eliminate improvers, to prevent the existence of such a class at all, to stop this pestilent manufacture of imperfect tradesmen. They want to prevent capable workmen of average capacity from being put out of work by men who submit to work for a smaller wage on some ground of incapacity, generally actual, sometimes only alleged.

From the point of view of this court, whose ideal is industrial peace, I feel even more strongly than before that the system of improvers, as it now stands, is a perpetual menace to the peace of the community.

Another point is that the improver is often kept exclusively for many years to one single machine of the simpler class, until he becomes extraordinarily apt to it. His speed is an argument for greater speed on the part of those before him and behind him in the team of men and boys working at some process. The worker before him must keep him fed with stuff; the worker

after him must not let the stuff accumulate; and the strain becomes intense. The specialized improver is often used to force the pace. But if the improver lose his little fraction of a job he is useless for any other job; to get a similar job elsewhere he must fight; his only weapon is to offer to submit to a reduction of wages, and inevitably he forces down the claims of the journeymen who are looking for work.

But what is the proper remedy? Or, rather—as my functions are limited—what is the proper order of this court to make under the circumstances? I cannot undertake the responsibility of telling every employer in the commonwealth what he ought to do in case of every employee at every stage on every day of his employment, and under all circumstances. I conceive it to be my duty to leave every employer free to carry on his own business on his own system, that he may make the greatest profit within his reach, so long as he does not perpetuate industrial trouble or endanger industrial peace; and that means so long as he satisfies the essential human needs of his employees and does not leave them under a sense of injustice.

In the strain of competition, the pressure on the employer is often very great, and he ought to be free to choose his employees on their merits and according to his own exigencies, free to make use of new machines, of improved methods, of financial advantages, of advantages of locality, of superior knowledge—free, in short, to put the utmost pressure on anything and everything except human life. Unless there is to be industrial war at every turn, human life must not be treated in the game of competition as if it were a ball to be kicked. This, the most valuable asset of the state, must be protected, whatever else suffers.

Extreme specialization injures the boy in his manhood and as a tradesman; and it is the cause of much industrial disturbance. Extreme specialization may make the output greater and cheaper, and may at the same time be injurious to the man and to the public.

The human factor cannot be ignored in the industries. Today the wage-earner's stimulation to greater physical exertion has been highly developed through the constant pressure brought to bear upon superintendents and foremen. Elaborate cost sheets are prepared monthly by every department, and those showing the lowest cost for production in similar departments are sent to the superintendents of those which show a higher cost, with the polite request: "Please report to us on the reasons why your department shows a higher cost for production during the month than Department A." Under this stimulus there generally is but one course pursued, that being to speed up labor.

Under the great concentration which has resulted in huge cor-

porations the former bond of personal interest between employer and workmen has disappeared; neither now knows the other; the one is only a number on a brass check or card, and the other may live a thousand miles away. The one who holds a brass check is forced to realize his position by the treatment accorded him by a foreman spurred on by the desire to secure a bonus for the large output of his department, and by the rigid discipline to which he must conform and the promptness with which he is discharged for any reason. Under present methods of production, where thousands of workmen are employed by a single corporation, it may be difficult to reintroduce the element of human sympathy between workmen and employer, but a truly scientific system of management cannot overlook this most important factor if it is to endure.

One feature of scientific management which has interested labor is its evident opposition to collective bargaining between organized workmen and their employers. The claim is practically made by some of its leading exponents that the system cannot be successfully applied unless the huge corporation insists on dealing with the workman as an individual and then on bringing every possible pressure, including discharge, upon him. A brief extract from a letter, which we were informed was written by one of the most prominent exponents of scientific management, to a firm which had tried the system for six years without success, bears witness to this fact. It read:

Have you tried the incisive plan of centering on one man instead of going at the whole shooting match at once? I think the failure is due to the lack of patient persistence on the part of the employers, and then to the lack of centering right on to a single man; no workman can long resist the help and persuasion of five foremen over him. He will either do the work as he is told or leave.

The implication is not difficult to grasp.

Where the large corporations have had a free hand in centering their stimulus to activity upon the individual workman and determining the conditions under which workmen will be employed, they have frequently accomplished results which, while probably showing increasing production per man have also developed conditions of labor which have shocked the moral and humane sense of the nation. An illustration is afforded by the iron and steel industry

which, according to the report of the Federal Department of Labor covering the month of May, 1910, indicated that 29 per cent of the 172,706 workmen included in the investigation, worked twelve hours per day, seven days in the week—eighty-four hours in all; and that every second week, when the shifts changed from day to night, or vice versa, many of these workmen were forced to remain on duty without relief from 18 to 24 hours. Of these 172,706 men, who included all unskilled and skilled workmen in the plants where investigations were made, 85,812, or 49.69 per cent received less than 18 cents per hour.

Practically every abuse, every arbitrary and unjust condition affecting workmen which has crept into our industries, has developed only where the workmen failed to enjoy the right of collective bargaining with their employers for the determination of the wage rate and the conditions under which labor was to be performed.

The specialization and subdivision of work, which as much as is possible tends to make the workmen specialists, that is to say, fractional mechanics, whose knowledge of a trade or industry is confined to but a few simple operations, is anything but a scientific method for developing and maintaining the necessary supply of mechanics, and in this direction scientific management seems to be most eminently unscientific.

It is unscientific because it does not include an adequate system for the education of apprentices from whom competent mechanics can be developed.

It is unscientific because it does not adequately provide for the workmen's progress in mechanical knowledge, but tends to restrict him to the subdivision of a specialty, keeping him endlessly performing the same operation, disregarding the fact that this constant repetition, which in time becomes semi-automatic on the workman's part, through its very monotony numbs the mind instead of inspiring it.

It is unscientific because if applied in all of our industries it would at once prevent the development of competent mechanics, and produce in their place fractional mechanics, who could work effectively only under the groups of functional foremen and superforemen provided for by the system.

It is unsafe as well as unscientific, inasmuch as its tendency is toward the production of quantity rather than quality. The number of bricks which can be laid in a day is one thing, the strength and durability of the wall being an entirely different matter. The number of steel rails which can be run through the rolls in a day may be an interesting item in the matter of production, but of far more importance to the public is the ability of these rails to stand the burden of traffic, instead of breaking under strain they should have been able to stand, and ditching the train with its passengers.

On this question of steel rails, the statement of Mr. M. H. Wickhorst, engineer for the American Railway Association, is valuable. In his paper on "Rail Research by Railroads and Producers," presented at the recent International Congress for Testing Materials, he said in part:

While the railroads were thus busy increasing the capacity of their motive power and cars, the steel mills were likewise endeavoring to secure increased tonnage. These efforts took the form of eliminating unnecessary delays, installing larger converters and more powerful machinery, and using larger ingots, and, sometimes, of allowing less time for the chemical reactions. At the height of the tonnage endeavor in the rail mills, about five years ago, there was considerable rivalry between the different mills to produce the greatest tonnage, and it reached a condition that might almost be termed madness, that had only secondary regard for the quality of the product. The purchaser had the choice of buying rails as made by the mills or going without them.

It is unscientific because it has failed adequately to understand the human factor and the spirit of our American institutions, for it makes of one man a taskmaker and a taskmaster without the free consent of the other. It ignores that principle so clearly set forth by the congressional committee, which, after investigating the Taylor and other systems of shop management, said in its report: "Government in a mill should be like government in a state, with the consent of the governed."

Scientific management thus seems to lay greater stress upon the quantity of production than upon its quality. It seems to give consideration to workmen more as units in production than as human beings; and in the unbridled efforts to increase production being made in many industrial establishments today it must

tend to approach as closely as possible the methods of those ancient Egyptian taskmasters who finally endeavored to have bricks made without straw.

In these respects in connection with its relation to labor, the term "scientific management" seems to be about as accurate as the name given to that little animal which has been the subject of so much scientific experimenting, the guinea-pig, which in the first place does not come from Guinea, and in the second, is not a pig.

To the experiments which may be made in the name of science to discover the highest speed which a machine can attain, its greatest capacity for production, and the minimum length of time in which its usefulness can be exhausted before it is discarded and thrown in the scrap heap, labor has no objections, but American workmen will object with all the strength at their command, and justly so, to all efforts to experiment likewise with them. With improved shop equipments and more efficient systems for routing, handling, machining, and assembling material in the course of construction, we are in harmony. But we are in most positive opposition to the application or continuation of any system which tends to deteriorate the American workman mentally, morally, or physically.

Organized labor believes that true scientific management is that which reduces the cost of production by eliminating useless labor, which improves the facilities for doing work by surrounding the workmen with good light, pure air, sanitary conditions, and safeguarded machinery. It is a system of management under which care will be taken to prevent workmen from overstrain as well as to provide that their output shall reach an adequate standard, and which will afford ample opportunity for the fullest development of mechanical and manual skill on the part of all workmen. It is a system under which the terms and conditions of employment will be governed by agreements entered into by employers and their workmen as a collective body. And finally, it is a form of management which will never allow quality to be sacrificed for quantity, nor men, women, and children to be classified with machines. The equity right of human flesh and blood must be recognized by any system that would endure.

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